


Use of GIS in Tracking Backflow Prevention Devices




LOUISIANA WATER QUALITY TECHNOLOGY CONFERENCE
24TH ANNUAL CONFERENCE PROGRAM


December 14, 2010
Alexandria, LA

December 15, 2010
Baton Rouge, LA


Robert F. Vinet, P.E.
BK BURK-KLEINPETER, INC.
PLUMBING, MECHANICAL, ELECTRICAL, ENVIRONMENTAL, SCIENCE




Overview




- **Backflow Prevention / Cross-Connection Control**
 - Under federal and state law, water suppliers are responsible for preventing water from unapproved sources or cross-connection hazards from entering the public potable water system.
- **What is a Backflow Prevention Program (BPP)?**
 - Systematically works on multiple levels to actively manage, standardize, regulate, and enforce the protection of the water distribution system from the possibility of contamination or pollution from backflow or backsiphonage from unapproved sources at water service connections.



Overview



- **Backflow Prevention Devices (BPD)**
 - A device or means designed to prevent backflow or backsiphonage.
 - Examples
 - Air gap
 - Atmospheric Vacuum Breaker
 - Double Check Valve
 - Reduced Pressure Zone Assembly
- **Louisiana State Plumbing Code**
 - The Code requires any device for the prevention of backflow or backsiphonage to be certified to meet the requirements determined by the administrative authority (generally the water supplier).



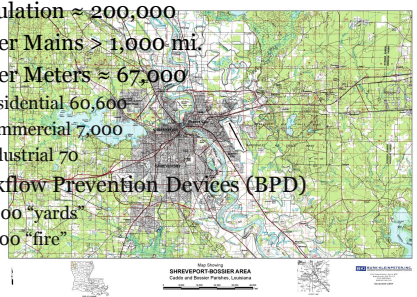
City of Shreveport

- The City has been proactive in comprehensively analyzing its water distribution system
 - Geographic Information System (GIS)
 - System and Facility Testing
 - Supervisory Control and Data Acquisition System (SCADA)
 - Hydraulic and Water Quality Model
 - Backflow Prevention / Cross-Connection Control
 - Water Security Technology
- Burk-Kleinpeter, Inc. (BKI) hired to assist in improving the City's existing BPP.

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City of Shreveport

- Population ~ 200,000
- Water Mains > 1,000 mi.
- Water Meters ~ 67,000
 - Residential 60,600
 - Commercial 7,000
 - Industrial 70
- Backflow Prevention Devices (BPD)
 - 6,200 "yards"
 - 1,000 "fire"



Map Source: SHREVEPORT-BOSSIER AREA
Cable and Remote Portable Location

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Backflow Preventer Inventory and Survey

- Review of Technology
 - Databases
 - Maps
 - ✧ Topography
 - ✧ Aerials
 - ✧ Parcel
 - ✧ Utility Data
 - ✧ Water Infrastructure Section and Intersection
 - Global Positioning System (GPS)
 - ✧ Survey
 - ✧ Data Collection
 - Geographic Information System (GIS)

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- Initial Database: Yard (6,200 records)

Age	Gender	Species	Location	Month/Year	Feeder	Food Source	Time	Rate (msec/step)	Rate (msec/step)	Rate (msec/step)
1	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	08:00	120	100	110
2	Female	Parakeet	Central Park	Jan 2023	No	Seeds	08:15	110	90	105
3	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	08:30	130	110	120
4	Female	Parakeet	Central Park	Jan 2023	No	Seeds	08:45	100	80	90
5	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	09:00	140	120	130
6	Female	Parakeet	Central Park	Jan 2023	No	Seeds	09:15	90	70	80
7	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	09:30	150	130	140
8	Female	Parakeet	Central Park	Jan 2023	No	Seeds	09:45	80	60	70
9	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	10:00	160	140	150
10	Female	Parakeet	Central Park	Jan 2023	No	Seeds	10:15	70	50	60
11	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	10:30	170	150	160
12	Female	Parakeet	Central Park	Jan 2023	No	Seeds	10:45	60	40	50
13	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	11:00	180	160	170
14	Female	Parakeet	Central Park	Jan 2023	No	Seeds	11:15	50	30	40
15	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	11:30	190	170	180
16	Female	Parakeet	Central Park	Jan 2023	No	Seeds	11:45	40	20	30
17	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	12:00	200	180	190
18	Female	Parakeet	Central Park	Jan 2023	No	Seeds	12:15	30	10	20
19	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	12:30	210	190	200
20	Female	Parakeet	Central Park	Jan 2023	No	Seeds	12:45	20	0	10
21	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	13:00	220	200	210
22	Female	Parakeet	Central Park	Jan 2023	No	Seeds	13:15	10	0	0
23	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	13:30	230	210	220
24	Female	Parakeet	Central Park	Jan 2023	No	Seeds	13:45	0	0	0
25	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	14:00	240	220	230
26	Female	Parakeet	Central Park	Jan 2023	No	Seeds	14:15	0	0	0
27	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	14:30	250	230	240
28	Female	Parakeet	Central Park	Jan 2023	No	Seeds	14:45	0	0	0
29	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	15:00	260	240	250
30	Female	Parakeet	Central Park	Jan 2023	No	Seeds	15:15	0	0	0
31	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	15:30	270	250	260
32	Female	Parakeet	Central Park	Jan 2023	No	Seeds	15:45	0	0	0
33	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	16:00	280	260	270
34	Female	Parakeet	Central Park	Jan 2023	No	Seeds	16:15	0	0	0
35	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	16:30	290	270	280
36	Female	Parakeet	Central Park	Jan 2023	No	Seeds	16:45	0	0	0
37	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	17:00	300	280	290
38	Female	Parakeet	Central Park	Jan 2023	No	Seeds	17:15	0	0	0
39	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	17:30	310	290	300
40	Female	Parakeet	Central Park	Jan 2023	No	Seeds	17:45	0	0	0
41	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	18:00	320	300	310
42	Female	Parakeet	Central Park	Jan 2023	No	Seeds	18:15	0	0	0
43	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	18:30	330	310	320
44	Female	Parakeet	Central Park	Jan 2023	No	Seeds	18:45	0	0	0
45	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	19:00	340	320	330
46	Female	Parakeet	Central Park	Jan 2023	No	Seeds	19:15	0	0	0
47	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	19:30	350	330	340
48	Female	Parakeet	Central Park	Jan 2023	No	Seeds	19:45	0	0	0
49	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	20:00	360	340	350
50	Female	Parakeet	Central Park	Jan 2023	No	Seeds	20:15	0	0	0
51	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	20:30	370	350	360
52	Female	Parakeet	Central Park	Jan 2023	No	Seeds	20:45	0	0	0
53	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	21:00	380	360	370
54	Female	Parakeet	Central Park	Jan 2023	No	Seeds	21:15	0	0	0
55	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	21:30	390	370	380
56	Female	Parakeet	Central Park	Jan 2023	No	Seeds	21:45	0	0	0
57	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	22:00	400	380	390
58	Female	Parakeet	Central Park	Jan 2023	No	Seeds	22:15	0	0	0
59	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	22:30	410	390	400
60	Female	Parakeet	Central Park	Jan 2023	No	Seeds	22:45	0	0	0
61	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	23:00	420	400	410
62	Female	Parakeet	Central Park	Jan 2023	No	Seeds	23:15	0	0	0
63	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	23:30	430	410	420
64	Female	Parakeet	Central Park	Jan 2023	No	Seeds	23:45	0	0	0
65	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	24:00	440	420	430
66	Female	Parakeet	Central Park	Jan 2023	No	Seeds	24:15	0	0	0
67	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	24:30	450	430	440
68	Female	Parakeet	Central Park	Jan 2023	No	Seeds	24:45	0	0	0
69	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	25:00	460	440	450
70	Female	Parakeet	Central Park	Jan 2023	No	Seeds	25:15	0	0	0
71	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	25:30	470	450	460
72	Female	Parakeet	Central Park	Jan 2023	No	Seeds	25:45	0	0	0
73	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	26:00	480	460	470
74	Female	Parakeet	Central Park	Jan 2023	No	Seeds	26:15	0	0	0
75	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	26:30	490	470	480
76	Female	Parakeet	Central Park	Jan 2023	No	Seeds	26:45	0	0	0
77	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	27:00	500	480	490
78	Female	Parakeet	Central Park	Jan 2023	No	Seeds	27:15	0	0	0
79	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	27:30	510	490	500
80	Female	Parakeet	Central Park	Jan 2023	No	Seeds	27:45	0	0	0
81	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	28:00	520	500	510
82	Female	Parakeet	Central Park	Jan 2023	No	Seeds	28:15	0	0	0
83	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	28:30	530	510	520
84	Female	Parakeet	Central Park	Jan 2023	No	Seeds	28:45	0	0	0
85	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	29:00	540	520	530
86	Female	Parakeet	Central Park	Jan 2023	No	Seeds	29:15	0	0	0
87	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	29:30	550	530	540
88	Female	Parakeet	Central Park	Jan 2023	No	Seeds	29:45	0	0	0
89	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	30:00	560	540	550
90	Female	Parakeet	Central Park	Jan 2023	No	Seeds	30:15	0	0	0
91	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	30:30	570	550	560
92	Female	Parakeet	Central Park	Jan 2023	No	Seeds	30:45	0	0	0
93	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	31:00	580	560	570
94	Female	Parakeet	Central Park	Jan 2023	No	Seeds	31:15	0	0	0
95	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	31:30	590	570	580
96	Female	Parakeet	Central Park	Jan 2023	No	Seeds	31:45	0	0	0
97	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	32:00	600	580	590
98	Female	Parakeet	Central Park	Jan 2023	No	Seeds	32:15	0	0	0
99	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	32:30	610	590	600
100	Female	Parakeet	Central Park	Jan 2023	No	Seeds	32:45	0	0	0
101	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	33:00	620	600	610
102	Female	Parakeet	Central Park	Jan 2023	No	Seeds	33:15	0	0	0
103	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	33:30	630	610	620
104	Female	Parakeet	Central Park	Jan 2023	No	Seeds	33:45	0	0	0
105	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	34:00	640	620	630
106	Female	Parakeet	Central Park	Jan 2023	No	Seeds	34:15	0	0	0
107	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	34:30	650	630	640
108	Female	Parakeet	Central Park	Jan 2023	No	Seeds	34:45	0	0	0
109	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	35:00	660	640	650
110	Female	Parakeet	Central Park	Jan 2023	No	Seeds	35:15	0	0	0
111	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	35:30	670	650	660
112	Female	Parakeet	Central Park	Jan 2023	No	Seeds	35:45	0	0	0
113	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	36:00	680	660	670
114	Female	Parakeet	Central Park	Jan 2023	No	Seeds	36:15	0	0	0
115	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	36:30	690	670	680
116	Female	Parakeet	Central Park	Jan 2023	No	Seeds	36:45	0	0	0
117	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	37:00	700	680	690
118	Female	Parakeet	Central Park	Jan 2023	No	Seeds	37:15	0	0	0
119	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	37:30	710	690	700
120	Female	Parakeet	Central Park	Jan 2023	No	Seeds	37:45	0	0	0
121	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	38:00	720	700	710
122	Female	Parakeet	Central Park	Jan 2023	No	Seeds	38:15	0	0	0
123	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	38:30	730	710	720
124	Female	Parakeet	Central Park	Jan 2023	No	Seeds	38:45	0	0	0
125	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	39:00	740	720	730
126	Female	Parakeet	Central Park	Jan 2023	No	Seeds	39:15	0	0	0
127	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	39:30	750	730	740
128	Female	Parakeet	Central Park	Jan 2023	No	Seeds	39:45	0	0	0
129	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	40:00	760	740	750
130	Female	Parakeet	Central Park	Jan 2023	No	Seeds	40:15	0	0	0
131	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	40:30	770	750	760
132	Female	Parakeet	Central Park	Jan 2023	No	Seeds	40:45	0	0	0
133	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	41:00	780	760	770
134	Female	Parakeet	Central Park	Jan 2023	No	Seeds	41:15	0	0	0
135	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	41:30	790	770	780
136	Female	Parakeet	Central Park	Jan 2023	No	Seeds	41:45	0	0	0
137	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	42:00	800	780	790
138	Female	Parakeet	Central Park	Jan 2023	No	Seeds	42:15	0	0	0
139	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	42:30	810	790	800
140	Female	Parakeet	Central Park	Jan 2023	No	Seeds	42:45	0	0	0
141	Male	Parakeet	Central Park	Jan 2023	Yes	Seeds	43:00	820	800	810
142	Female	Parakeet	Central							

- Initial Database: Yard (6,200 records)

- Earliest entry: 1975
- Fields: 13
 - ✧ Address
 - ✧ Street
 - ✧ Owner
 - ✧ Comments
 - ✧ Location
 - ✧ Manufacturer
 - ✧ Plumber
 - ✧ Serial Number
 - ✧ Size
 - ✧ Type
 - ✧ Date Inspected
 - ✧ Date Installed
 - ✧ Next Inspection

- Initial Database: Fire (1,000 records)

Age	Event	Place	Date	Revised Date	Support	Site	Event Manager	Location	Notes
748	Amo	Amo	1968						
749	Amo	Amo	1968						
750	Amo	Amo	1968						
751	Amo	Amo	1968						
752	Amo	Amo	1968						
753	Amo	Amo	1968						
754	Amo	Amo	1968						
755	Amo	Amo	1968						
756	Amo	Amo	1968						
757	Amo	Amo	1968						
758	Amo	Amo	1968						
759	Amo	Amo	1968						
760	Amo	Amo	1968						
761	Amo	Amo	1968						
762	Amo	Amo	1968						
763	Amo	Amo	1968						
764	Amo	Amo	1968						
765	Amo	Amo	1968						
766	Amo	Amo	1968						
767	Amo	Amo	1968						
768	Amo	Amo	1968						
769	Amo	Amo	1968						
770	Amo	Amo	1968						
771	Amo	Amo	1968						
772	Amo	Amo	1968						
773	Amo	Amo	1968						
774	Amo	Amo	1968						
775	Amo	Amo	1968						
776	Amo	Amo	1968						
777	Amo	Amo	1968						
778	Amo	Amo	1968						
779	Amo	Amo	1968						
780	Amo	Amo	1968						
781	Amo	Amo	1968						
782	Amo	Amo	1968						
783	Amo	Amo	1968						
784	Amo	Amo	1968						
785	Amo	Amo	1968						
786	Amo	Amo	1968						
787	Amo	Amo	1968						
788	Amo	Amo	1968						
789	Amo	Amo	1968						
790	Amo	Amo	1968						
791	Amo	Amo	1968						
792	Amo	Amo	1968						
793	Amo	Amo	1968						
794	Amo	Amo	1968						
795	Amo	Amo	1968						
796	Amo	Amo	1968						
797	Amo	Amo	1968						
798	Amo	Amo	1968						
799	Amo	Amo	1968						
800	Amo	Amo	1968						
801	Amo	Amo	1968						
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803	Amo	Amo	1968						
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805	Amo	Amo	1968						
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807	Amo	Amo	1968						
808	Amo	Amo	1968						
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810	Amo	Amo	1968						
811	Amo	Amo	1968						
812	Amo	Amo	1968						
813	Amo	Amo	1968						

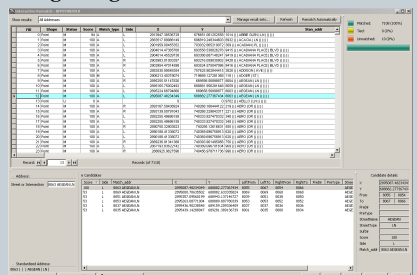
Backflow Preventer Inventory and Survey

- Initial Database: Fire (1,000 records)
 - Earliest entry: 1980
 - Fields: 11
 - Address
 - Street
 - Owner
 - Plumber
 - Date Installed
 - Date Inspected
 - Size
 - Serial Number
 - Manufacturer
 - Location
 - Next Inspection

BK BURK-KLEINPETER, INC.

Backflow Preventer Inventory and Survey

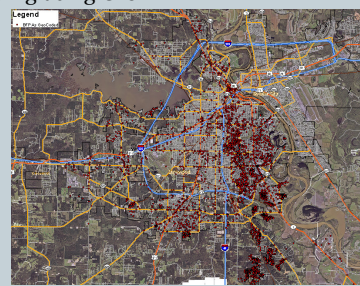
- Geocoding using GIS



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Backflow Preventer Inventory and Survey

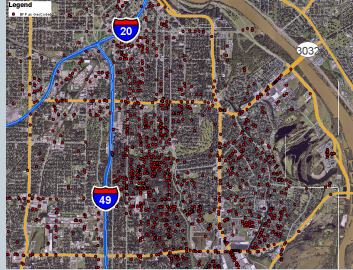
- Geocoding using GIS



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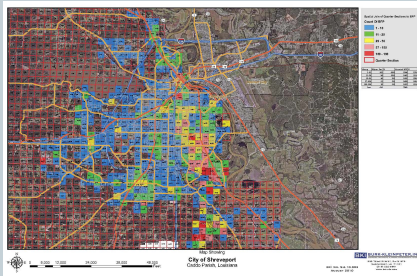
Backflow Preventer Inventory and Survey

- Geocoding using GIS

 **BURK-KLEINPETER, INC.**
ENGINEERS, ARCHITECTS, PLANNERS, ENVIRONMENTAL SCIENTISTS

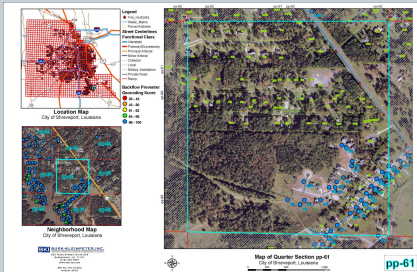
Backflow Preventer Inventory and Survey

- Geocoding using GIS

 **BURK-KLEINPETER, INC.**
ENGINEERS, ARCHITECTS, PLANNERS, ENVIRONMENTAL, SURVEYORS

Backflow Preventer Inventory and Survey

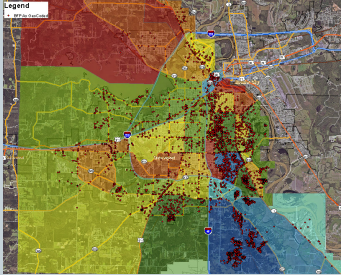
- Geocoding using GIS



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ENGINEERS, ARCHITECTS, PLANNERS, ENVIRONMENTAL, SCIENTISTS

Backflow Preventer Inventory and Survey

- Organizing the Survey... Logical Task Units (LTU)

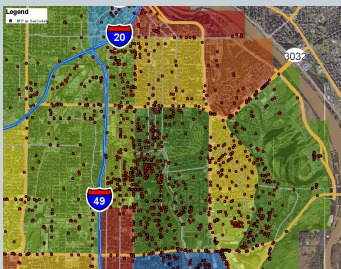


Legend

BURK-KLEINPETER, INC.

Backflow Preventer Inventory and Survey

- Organizing the Survey... Logical Task Units (LTU)

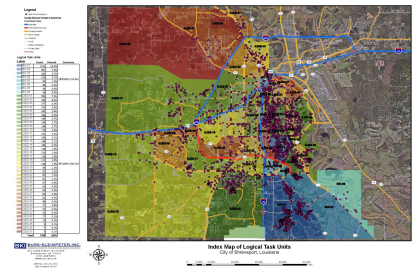


Legend

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Backflow Preventer Inventory and Survey

- Logical Task Units



Legend

BURK-KLEINPETER, INC.

Backflow Preventer Inventory and Survey

- Logical Task Units

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BK BURK-KLEINPETER-INC.

Backflow Preventer Inventory and Survey

- Survey

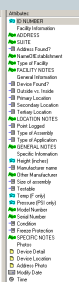
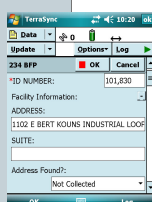
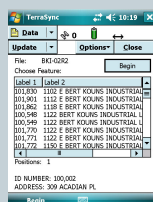
- GPS handheld device capable of data collection



BK BURK-KLEINPETER, INC.
EXTERIOR ARCHITECTS, 30 HUNTER CIRCLE, SUITE 200, ALBANY, NY 12208

Backflow Preventer Inventory and Survey

- Survey



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MANAGEMENT CONSULTANTS • PLANNERS • ENGINEERS • ARCHITECTS

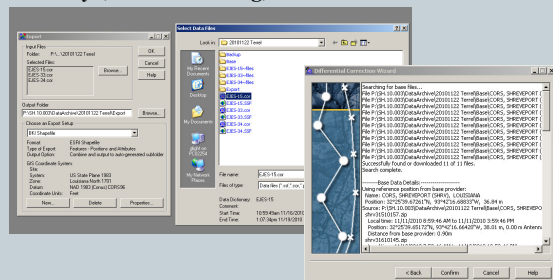
Backflow Preventer Inventory and Survey

- Type of Data Collected
 - Latitude and Longitude
 - Photographs
 - Device Information
 - Type (e.g., DCVA, DCDA, RPZA, RPDA, Air Gap)
 - Size
 - Manufacturer
 - Model No.
 - Serial No.
 - Condition assessment
 - Maximum working water pressure
 - Testability
 - Height of assembly above surface
 - Location description
 - Freeze protection
 - Type of Facility (e.g., manufacturing plant, car wash, hospital, residence)
 - Type of Application (e.g., service, lawn irrigation, fire system)

BK BURK-KLEINPETER, INC.

Backflow Preventer Inventory and Survey

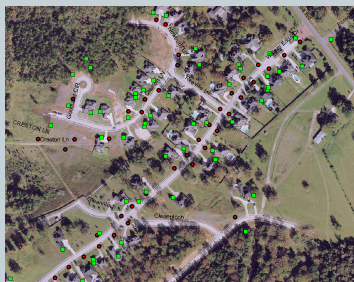
- Survey (Post-Processing)



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Backflow Preventer Inventory and Survey

- Survey Results



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Backflow Preventer Inventory and Survey

- Survey Results

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Backflow Preventer Inventory and Survey

- Public Awareness

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Backflow Preventer Inventory and Survey

- Further processing...
 - Cross-reference each device to its corresponding water meter
 - Assign an initial priority of facility hazard based on physical observed data
 - All results to be developed into a final inventory and GIS Shapefile
- What's next?
 - City to implement asset management software that integrates the backflow prevention inventory database and manages the BPP.
 - Software capable of
 - Data entry
 - Generating reports
 - Monitoring annual inspections
 - Generating form letters and notifications

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Use of GIS in Tracking
Backflow Prevention Devices

QUESTIONS?

 **BURK-KLEINPETER, INC.**
ENGINEERS, ARCHITECTS, PLANNERS, ENVIRONMENTAL SCIENTISTS

